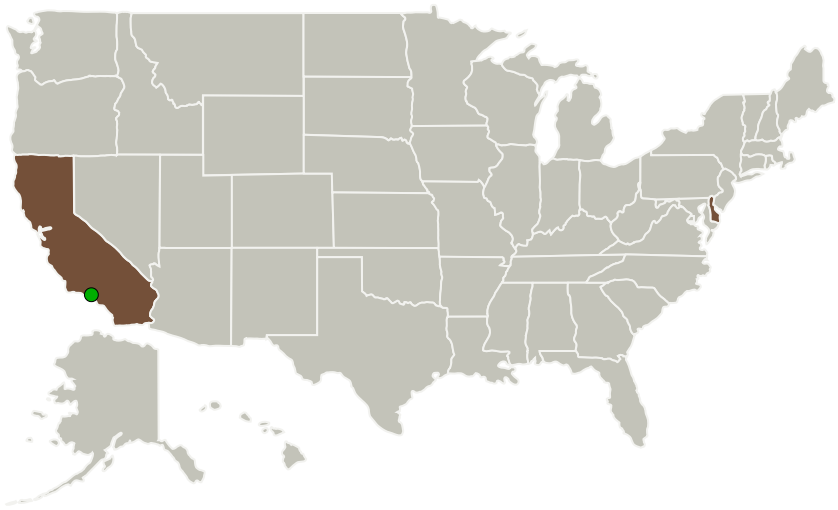
A Novel 3D Printer to Support Additive Manufacturing of Gradient Metal Alloy Structures, Phase II

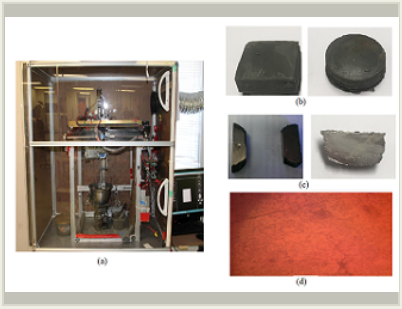
Completed Technology Project (2016 - 2018)

Project Introduction

Gradient metal alloy structures possess multi-functional properties that conventional monolithic metal counterparts do not have. Such structures can potentially change the paradigm of material selections and mechanical designs to enable more efficient space vehicles to be built. Existing laser-based additive manufacturing techniques for gradient metal alloy fabrication suffer from the following two major drawbacks: high system cost and slow printing speed. In this proposal, AlphaSense details the development of a novel 3D printer for the fabrications of gradient metal alloy structures. Key innovations of this proposal include the following: a) The fabrication of gradient metal alloy parts using low-cost resin as starting materials, b) The development of novel printing slurries containing micro-/nano- sized metal particles and photo-curable resins to fabricate the green parts, and c) The application of a Digital Light Processing (DLP) projector for simultaneous layer exposure. With such innovations, the merits of the proposed 3D printing method for metal part fabrication include the following: a) Low fabrication cost, b) High printing speed, c) Superior printing quality, d) Easy to scale up and e) Easy and well-controlled process.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
AlphaSense, Inc.	Lead Organization	Industry Women-Owned Small Business (WOSB)	Wilmington, Delaware
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Delaware

Project Transitions

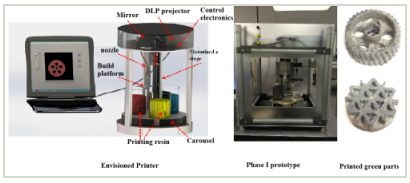
September 2016: Project Start

September 2018: Closed out

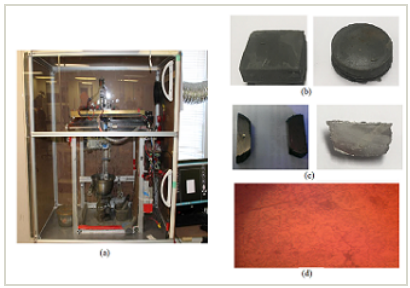
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140801)*

Images



Briefing Chart Image
A Novel 3D Printer to Support Additive Manufacturing of Gradient Metal Alloy Structures, Phase II *(https://techport.nasa.gov/image/127641)*



Final Summary Chart Image
A Novel 3D Printer to Support Additive Manufacturing of Gradient Metal Alloy Structures, Phase II *(https://techport.nasa.gov/image/137255)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
AlphaSense, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

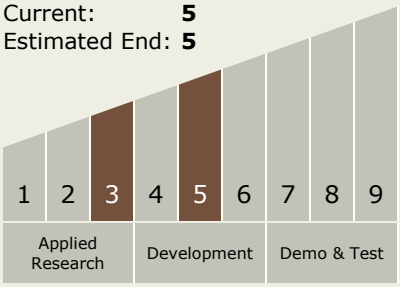
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Co-Investigator:
Pengcheng Lv

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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Completed Technology Project (2016 - 2018)

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.4 Manufacturing
    - TX12.4.1 Manufacturing Processes

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System